



National Aeronautics and
Space Administration

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, California

Acquiring and Using the Advanced Multi-Mission Operations System (AMMOS)

The AMMOS is a NASA resource that can reduce the cost and risk of:

- **Building or acquiring a project's mission operations system**
- **Conducting mission operations**

William Knopf

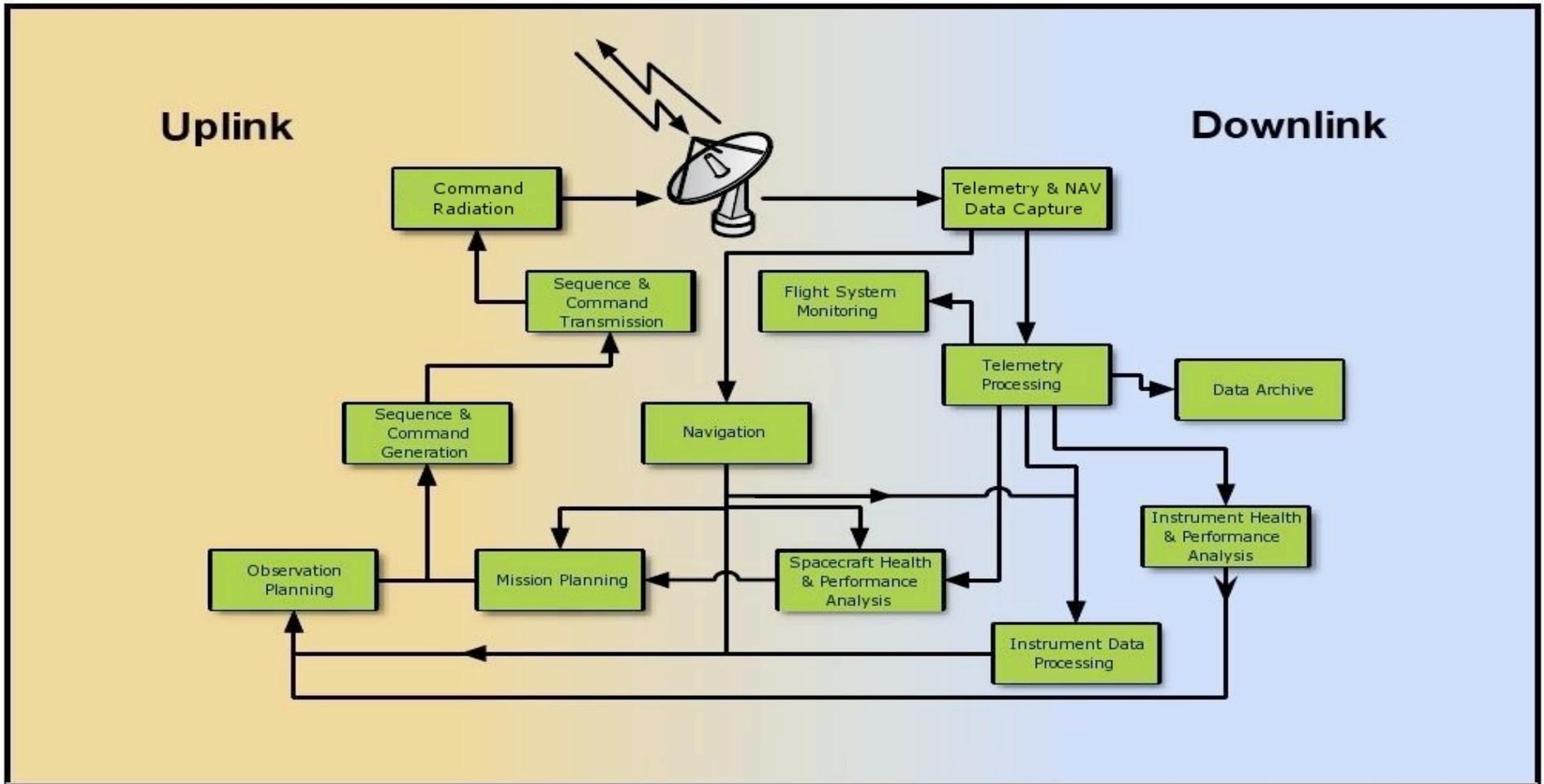
Program Executive, Advanced Multi-Mission Operations System
Mission Operations Coordinator
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AGENDA

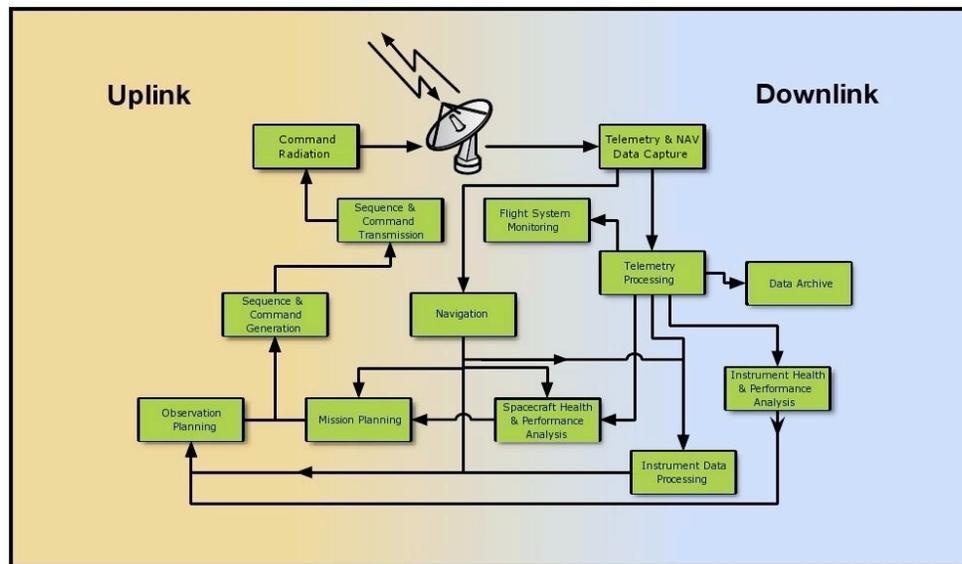
- What is the AMMOS?
 - Services offered
- What are the potential benefits?
- How to get more information?
- How much does it cost?
- Who to call?

Background

A typical decomposition of an MOS into Functional Elements is shown below



Background



- Your Project must acquire/develop, integrate, and operate each of these 13 functional elements of its MOS
- Each element contains hardware, a number of software elements, people, procedures, and facilities

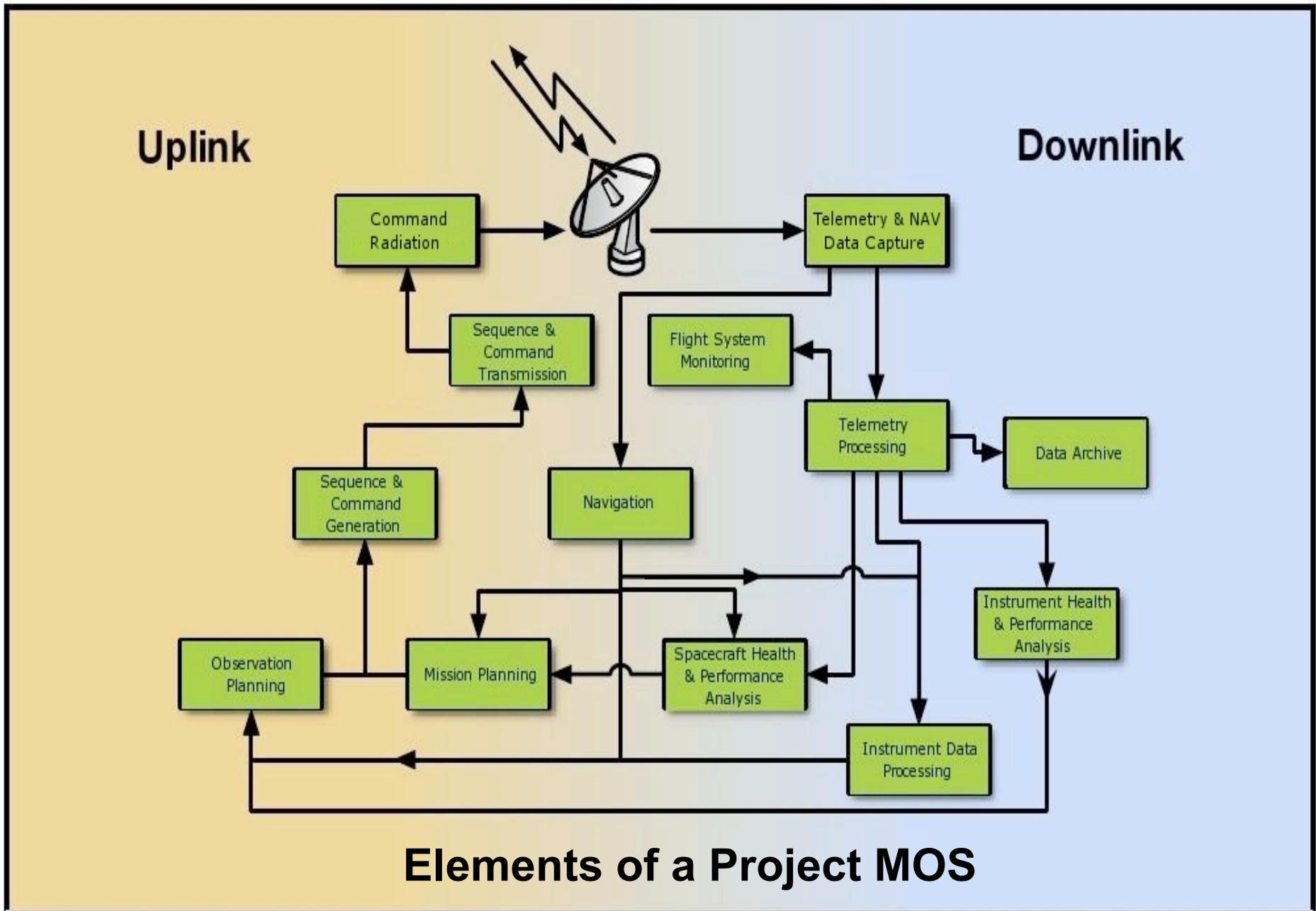
The AMMOS is based upon a simple idea: For those elements of mission operations systems that are common to multiple projects, build them once rather than duplicating that development and maintenance effort for each project

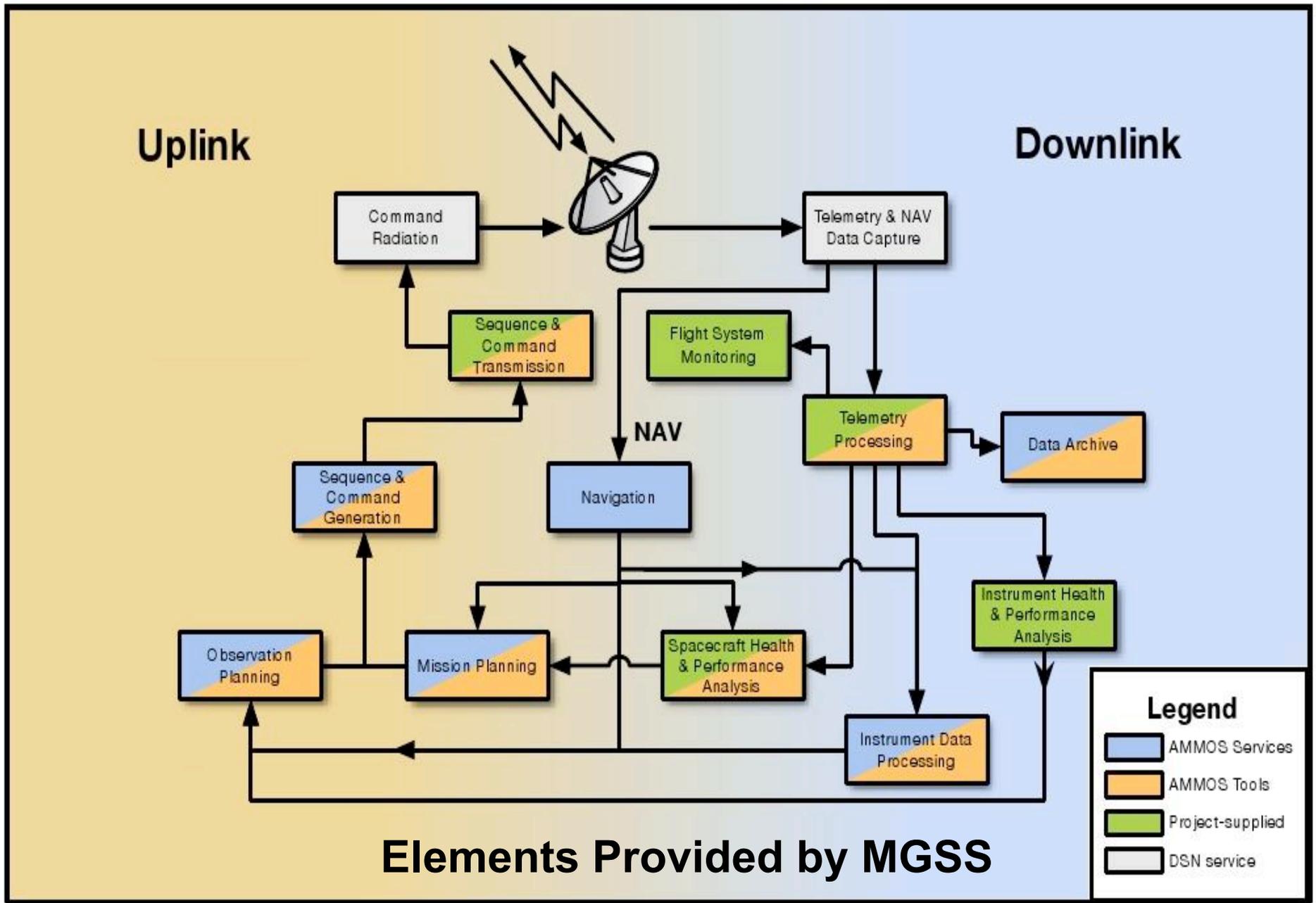
The Advanced Multi-Mission Operations System (AMMOS)

- The Multi-Mission Ground Systems and Services Office (MGSS) at JPL is the organization responsible for managing the AMMOS
- The AMMOS comprises MOS software, systems, and services that can serve multiple projects
 - MGSS provides tools and services that are common to most ***deep space*** and ***astrophysics missions***
 - MGSS exists for one principal reason: Reduce the net cost and risk to the Projects and NASA
- Projects can choose to obtain elements of their MOS from the AMMOS
 - The AMMOS systems must be customized (adapted) to project specifications
 - Project is likely to require some project specific developments
 - The Project integrates AMMOS elements with the project specific elements to produce a complete Project MOS (or MGSS can do that for you)

What is the AMMOS?

- MGSS offers tools and services for:
 - Navigation and Mission Design
 - Mission Planning and Sequencing
 - Spacecraft Health and Performance Analysis
 - Mission Control and Flight System Monitoring
 - Data Management and Archiving
 - Telemetry and Command
 - Computing and Communications
 - Instrument Operations
 - Instrument Data Processing

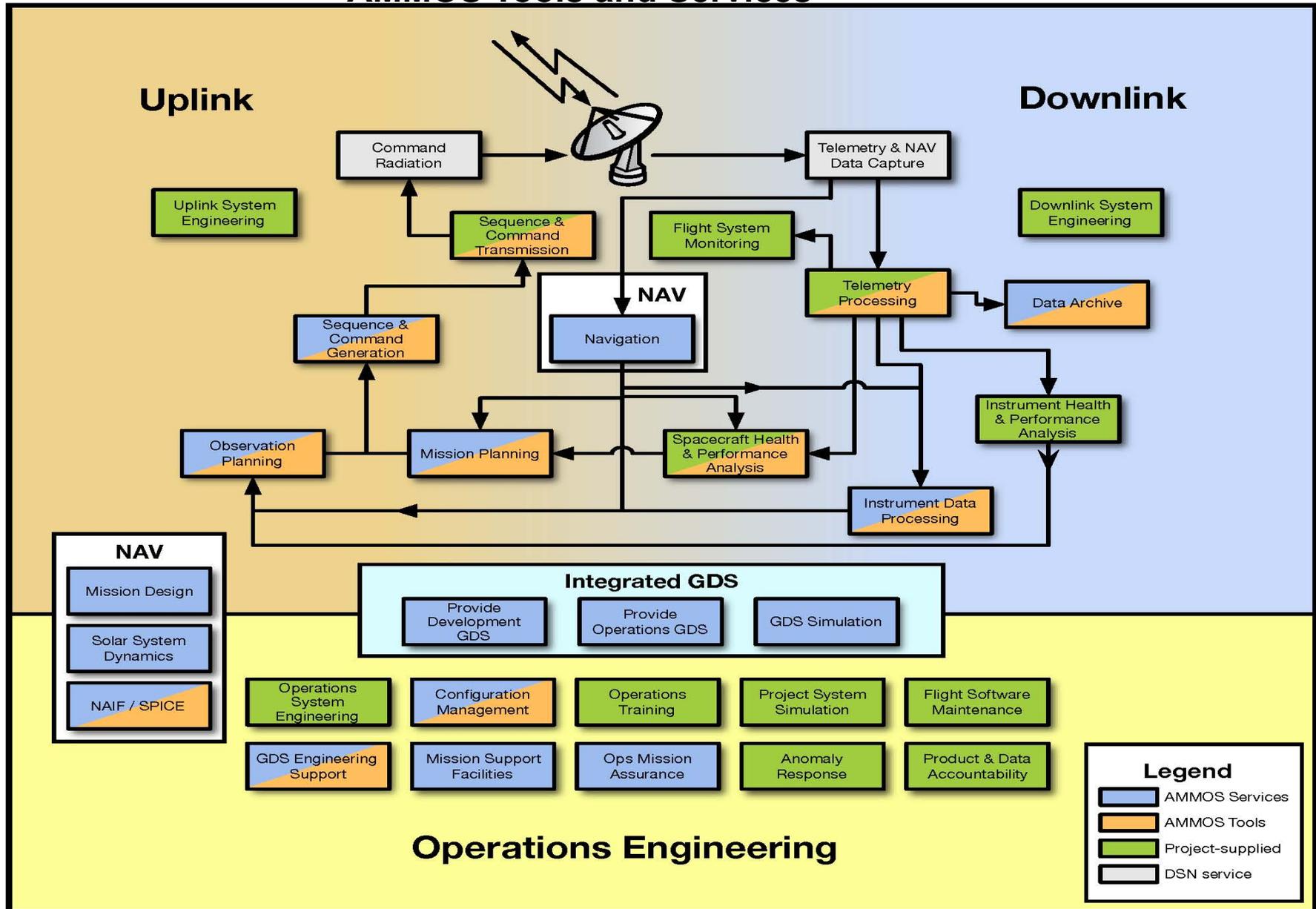




What is the AMMOS?

- MGSS also offers “Operations Engineering” Services
 - Mission Design
 - Solar System Dynamics
 - Planetary, satellite and small body ephemerides
 - Gravity modeling
 - Ancillary Data Dissemination (NAIF/SPICE)
 - GDS Integration, Test, and Deployment
 - Operations Configuration Management
 - GDS Engineering Support
 - Mission Support Facilities Services
 - Operations Mission Assurance

AMMOS Tools and Services



Why Use the AMMOS?

- Lower cost – Project does not have to pay for the development of the capability
- Shorter development cycle – Adaptation takes less time than development
- Lower Risk – The AMMOS is a mature system – most AMMOS elements have been maintained and improved for many years and have been used by a variety of projects in a variety of situations. Most bugs have been discovered and resolved

How Do I Learn About the AMMOS?

- Go to the AMMOS website (<http://AMMOS.jpl.nasa.gov>)
 - Contains a lot of information about the AMMOS
 - What it is
 - Future plans
 - Benefits
 - Customer list
 - Contact information
- Search the AMMOS Tools and Services Catalog (accessible from the AMMOS website)
 - Provides a list and detailed description of each of the tools and services you can obtain from MGSS
 - Provides two modes:
 - Recommends a system configuration for your mission
 - Expert mode: You select specific tools and services you want
- Contact the MGSS Program Office (see last slide)

How Do I Learn About the AMMOS?

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AMMOS

Advanced Multi-Mission Operations System

Managed by the Multimission Ground System and Services Office

Home

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Welcome

The **Advanced Multi-Mission Operations System (AMMOS)** is NASA's choice for **Mission Operations System (MOS)** tools and services supporting NASA Deep Space and Astrophysics missions because of the quality and cost of our products. The AMMOS provides a core set of products that can be readily customized to accommodate the specific needs of individual missions. Using AMMOS lowers mission cost and risk by providing a mature base for mission operations systems at significantly reduced development time.

The AMMOS provides most of the functions needed to support the design, implementation, and operation of an MOS, consisting of tools and services for the following activities:

- **Uplink** - planning and commanding science observations and engineering activities
- **Downlink** - capturing and distributing flight system data, maintaining knowledge of flight system performance and ensuring its continued health and safety
- **Navigation** - maintaining knowledge of flight system location and planning its trajectory for future mission activities
- **Ground Data System (GDS) Integration** - integrating, installing, and maintaining GDS hardware and software in development, operations and testbed environments
- **Operations Engineering** - cross-cutting and support functions necessary to operate and sustain an MOS

The AMMOS is managed by the **Multimission Ground System and Services Office (MGSS)** within the Interplanetary Network Directorate at the **Jet Propulsion Laboratory (JPL)** established by the **California Institute of Technology (Caltech)**. The mission of the MGSS is to meet customer needs for MOS solutions at reduced overall cost and risk, and to improve and refine ground system tools and services to meet the challenges of future NASA Missions.

Tools & Service Catalog

Contribute to AMMOS

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PRIVACY STATEMENT
SITEMAP

Site Manager: Pamela Wonick
Webmaster: Cornell Lewis
JPL Clearance: CL#08-2435

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AMMOS CATALOG

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AMMOS Catalog

This Tools and Services Catalog provides a comprehensive overview of the capabilities available from Multimission Ground Systems and Services office (MGSS) to fully support the entire lifecycle of a flight project or experimental investigation. The capabilities described here are focused mainly on deep space missions, high Earth orbiter missions, and ground-based observational science, although many are potentially applicable to other mission domains.

This catalog tool is intended to help you get a preliminary idea of the tools and services to support your mission. To get a refined set of tools and services and a higher fidelity cost estimate you need to contact the MGSS Program Office at JPL.

The descriptions given in this Services Catalog are intended to aid those preparing mission and experiment proposals, as well those in the early stages of project planning. This catalog categorizes these capabilities as tools and services and are defined as follows:

 Tool	 Service
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Tool
A piece of software or a package of AMMOS core software that is adapted to a project per the missions specific requirements.

Service
A service is a functionality that is provided by MGSS personnel to a project. The project uses MGSS expertise rather than obtaining and using the tools directly.

Projects can choose the multimission elements as well as project-specific adaptations for their mission operations and ground data systems for their particular mission. The cost of adapting and maintaining the tools and creating a project's mission operations system are charged to the benefiting mission. If new capabilities are required for a mission, but the new capability would benefit several missions, MGSS may pay for some or all of the development. Adaptation to a project's needs takes much less time than would be required for the development of the mission operations system by individual projects (weeks or months compared with years), and projects enjoy greater reliability by using modern and proven tools.

To obtain information on how to use the Tools and Services Catalog, please check the 'How To' section or contact the [JPL MGSS Program Office](#).

If you would like assistance obtaining a system, click "[Select System](#)"
-or-
If you would like to start navigating catalog components, click "[Browse](#)".
-or-
Please select a category

- AMMOS CATALOG
 - 1. Catalog Purpose
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 - 6. Obtaining Tools, Services and Support
 - 6.1. Points of Contact
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What is the cost to Projects?

- Original development of multi-mission systems is funded by HQ
- Projects pay for use of those systems (market paradigm – full cost recovery)
 - Adaptation
 - Operations services
 - Project hardware (workstations, routers, etc.)
 - Project-specific functionality

Project only “buys” the multi-mission element if it’s the best deal!

What is the cost to Projects?

- The AMMOS Catalog includes a “notional” cost for each of the tools and services in the Catalog
 - This provides a ball-park estimate but does not constitute, in any form, a commitment
 - Actual cost is highly dependent upon specific project needs and requires detailed discussion with AMMOS experts
 - Budgeting for AMMOS costs is similar to budgeting other Project elements
 - Team GST can provide an early cost estimate for your MOS
- Additional “cost” to Projects:

Some reduced control; some compromise to accommodate other projects’ needs

How Do I Work with the MGSS?

- Projects generally assign this responsibility to the MOS Manager or Mission Systems Manager
- In the conceptual phase, the MGSS Commitments Office will assign a commitments engineer to work with your mission
- When the Project is approved, the agreements between MGSS and the project will be formalized in a signed commitments agreement (Service-level Agreement or SLA)
 - The SLA is maintained under configuration control
 - Changes require approval from the Project and the MGSS change boards

Who Do I Call?

- You (or your MOS Manager or Mission Systems Manager) should call:

Brian Morrison, MGSS Commitments Engineer

818-354-2458

- Priscilla Parrish, the Deputy MGSS Commitments Engineer, is in attendance today and is available to answer questions and to provide further information



AMMOS Evolution

- NASA has opened the development and evolution of the AMMOS beyond JPL to other key planetary program participants in the NASA community, including (but not limited to) The Johns Hopkins University Applied Physics Laboratory, NASA Ames Research Center, and the NASA Goddard Space Flight Center.
- The AMMOS is funded by the NASA Science Mission Directorate, Planetary Science Division, and is available to proposers as the baseline operations and ground systems option, but is not required.
 - When alternative solutions to the AMMOS are proposed, NASA requests an explanation of the requirements that the AMMOS could not satisfy for the proposal.
 - Please provide feedback to me at william.knopf-1@nasa.gov